

1. A kit for imparting a pre-determined color to a wood substrate, comprising:

(a) a solution of a mineral salt, and

(b) a solution of (an oxidizing agent), *a peroxide*

the mineral salt and oxidizing agent solutions being applied sequentially in effective amounts to the wood substrate, sequentially penetrating a surface of the wood substrate, reacting with each other in the presence of the wood substrate and imparting the color to the wood substrate.

2. A method for treating a (wood) substrate comprising the steps of:

(a) contacting a surface of a wood substrate with a first formulation comprising a metal salt (and a solvent),

(b) penetrating the surface of the wood substrate with an effective amount of the first formulation to penetrate the wood substrate, and sequentially

(c) contacting the wood substrate with a second formulation comprising (an oxidizing agent and a solvent),

(d) penetrating the surface of the wood substrate with an effective amount of the second formulation,

(e) reacting the first and second formulations with each other in contact with the wood substrate, and

(f) imparting a stable change to the characteristics of the wood substrate.

3. The method of claim 2, wherein the oxidizing agent is (sodium peroxide or sodium hydroxide) and the solvents in the first

and second formulations are acids, alcohol, water or combinations.

4. The method of claim 2, wherein the metal salt is selected from the group consisting of salts of iron, silver, zinc, cerium, copper, gold, magnesium, molybdenum, nickel, tin, chromium, aluminum, barium, calcium, sodium, potassium, and titanium, and combinations.

5. The method of claim 2, wherein the metal salt is selected from the group consisting of salts of aluminum, antimony, beryllium, bismuth, cadmium, chromium, cobalt, copper, gold, iridium, lead, magnesium, manganese, mercury, molybdenum, nickel, niobium, osmium, platinum, plutonium, potassium, rhodium, selenium, silicon, silver, sodium, tantalum, thorium, tin, titanium, tungsten, uranium, vanadium, and zinc, and combinations.

6. The method of claim 2, wherein the metal salt is selected from the group consisting of sulfates, chlorides, perchlorates, acetates, nitrates, permanganates, thiosulfates, and oxides, and combinations.

7. The method of claim 2, wherein the metal salt is selected from the group consisting of silver sulfate, silver perchlorate, silver nitrate, silver sulfate, iron (II) chloride, zinc perchlorate, iron (II) perchlorate, iron (II) sulfate, copper acetate, sodium thiosulfate, magnesium thiosulfate, potassium thiosulfate, potassium nitrate, potassium permanganate, copper nitrate, copper II carbonate dihydroxide, copper sulfate,

titanium III sulfate, magnesium nitrate, cerium (III) perchlorate, and cerium nitrate, and combinations.

8. The method of claim 2, wherein the metal salt is selected from the group consisting of molybdenum (VI) oxide, zinc sulfate, copper (II) chloride, nickel perchlorate, nickel sulfate, copper (II) perchlorate, tin (II) sulfate, tin (I) chloride, chromium (III) sulfate, aluminum sulfate, cerium (III) perchlorate, zinc peroxide, titanium hydride, chromium (III) perchlorate, zinc powder, manganese (II) chloride, aluminum chloride, titanium (IV) chloride, silver chloride, and titanium (II) sulfate, and combinations.

9. The method of claim 2, wherein the oxidizing agent is sodium hydroxide.

10. The method of claim 2, wherein the oxidizing agent is selected from the group consisting of hydrogen peroxide, sodium peroxide, zinc peroxide, calcium peroxide, barium peroxide, and lithium peroxide, sodium hydroxide and combinations.

11. The method of claim 2, wherein the wood substrate is a close grain wood.

12. The method of claim 2, wherein the wood substrate is a wood-like product.

13. The method of claim 2, wherein the wood substrate is selected from the group consisting of hardwoods, soft woods, porous surface woods and close grain wood, and manufactured wood products.

14. The method of claim 2, wherein the wood substrate is a hardwood manufactured wood product.

15. The method of claim 2, wherein the wood substrate is a soft wood manufactured wood product.

16. The method of claim 2, wherein the wood substrate is a pine wood.

17. The method of claim 2, wherein the effect imparted to the wood substrate is a color.

18. The method of claim 2, wherein step (a) is performed before step (c).

19. The method of claim 2, wherein step (c) is performed before step (a).

20. The method of claim 2, further comprising the step of drying the wood substrate between step (b) and step (c).

21. The method of claim 2, wherein the solvents in the first and second preparations comprise aqueous alcohol or acid solutions, and wherein the contacting comprises applying the first and second formulations between the freezing point and boiling point of the formulations under the process conditions of the method.

22. The method of claim 2, further comprising applying a sealing coat over the surface of the wood substrate.

23. An article of manufacture comprising a wood substrate treated by the method of claim 2.

24. An article of manufacture according to claim 23, wherein the change imparted is a color change.

25. An article of manufacture comprising a wood substrate having a surface penetrated by a compound imparting a changed fixed physical characteristic of the wood substrate, the compound being produced in situ by a chemical reaction occurring in contact with the wood substrate between a metal salt and an oxidizing agent when the metal salt and the oxidizing agent are applied sequentially to the article.

26. An article of manufacture according to claim 25, wherein the changed fixed physical characteristic is a color change.

27. An article of manufacture according to claim 25, wherein the wood substrate is a hardwood.

28. An article of manufacture according to claim 25, wherein the substrate is a soft wood.

29. An article of manufacture according to claim 26, wherein the wood substrate is a sustainably harvested wood or manufactured wood product, the fixed color change is an earth tone.

30. A kit for treating a wood substrate, comprising  
(a) a first formulation of a metal salt and a solvent,  
(b) a second formulation of an oxidizing agent and a solvent; and

(c) instructions for sequentially applying the first and the second or the second and the first formulations for penetrating the wood substrate when applied, and both formulations, when applied sequentially in effective amounts,

reacting with each other in situ and imparting a changed fixed physical characteristic to the wood substrate.

31. The kit of claim 30, wherein at least one of the first formulation of the metal salt and the second formulation of the oxidizing agent formulation further comprises an additive selected from the group consisting of thickener, alcohol, emulsifier, coloring agent, pigment, dye, bleach, sealer, finishing agent, tint, acrylic finish, latex finish, polyurethane, alcohol, gelling agent, tableting agent, surfactant, buffer, citric acid, tannic acid, acetic acid, other acid, base, color, salt, stabilizer, antimicrobial, antifungal, insecticide, insect repellent, ultraviolet protectant, and fire retardant, and combinations.

32. The kit of claim 30, wherein the metal salt first formulation is a solution comprising between about 0.001% and about 20% (w/v) metal salt.

33. The kit of claim 30, wherein the oxidizing agent second formulation is a solution comprising between about 0.1% and about 50% (w/v) peroxide or hydroxide solution.

34. The kit of claim 30, wherein the metal salt first formulation is a solution comprising between about 0.025% and about 20% or more (w/v) metal salt.

35. The kit of claim 30, wherein the oxidizing agent second formulation is a solution comprising between about 0.1% and about 25% peroxide or hydroxide.

36. The kit of claim 30, wherein the first and second formulations are concentrates for diluting with solvents by a user.

37. A kit for imparting a predetermined color in a surface of a wood substrate, comprising:

(a) a first solution of a first component consisting of a mineral salt and a solvent as a first application on a surface of the wood substrate, and

(b) a second component comprising a second solution of an oxidizing agent and a solvent as a sequential application on the surface of the wood substrate, for applying the mineral salt and oxidizing agent solutions sequentially in effective amounts to the surface of the wood substrate, reacting with each other in situ in the presence of the wood substrate, and imparting the predetermined color to the wood substrate.

38. A kit for coloring a wood substrate, comprising:

(a) a first component solution of oxidizable metal salt and a solvent preparation for a first application to the wood substrate, and

(b) a second component solution of oxidizing agent and a solvent preparation for a sequential application to the wood substrate,

for sequentially applying and penetrating the first and second preparations and the wood substrate when sequentially applied, and both solution preparations when applied sequentially in effective amounts, reacting with each other in situ within the

wood substrate and imparting physical color characteristic change to the wood substrate.

39. The kit of claim 38, wherein the metal salt preparation and/or the oxidizing agent preparation further comprises an additive selected from the group consisting of thickener, emulsifier, coloring agent, pigment, dye, bleach, sealer, finishing agent, tint, acrylic finish, latex finish, polyurethane, alcohol, gelling agent, tableting agent, surfactant, buffer, citric acid, tannic acid, acetic acid, other acid, color, salt, stabilizer, antimicrobial, antifungal, insecticide, insect repellent, ultraviolet protectant, and fire retardant, and combinations.

40. The kit of claim 38, wherein the oxidizing agent is a peroxide or a hydroxide and the solvents in both preparations further comprise acids, alcohol, water or combinations.

41. The kit of claim 38, wherein the metal salt is selected from the group consisting of salts of iron, silver, zinc, cerium, copper, gold, magnesium, molybdenum, nickel, tin, chromium, aluminum, barium, calcium, sodium, potassium, and titanium, and combinations thereof.

42. The kit of claim 38, wherein the metal salt is selected from the group consisting of salts of aluminum, antimony, beryllium, bismuth, cadmium, chromium, cobalt, copper, gold, iridium, lead, magnesium, manganese, mercury, molybdenum, nickel, niobium, osmium, platinum, plutonium, potassium, rhodium, selenium, silicon, silver, sodium, tantalum, thorium, tin,

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titanium, tungsten, uranium, vanadium, and zinc, and combinations thereof.

43. The kit of claim 38, wherein the metal salt is selected from the group consisting of sulfates, chlorides, perchlorates, acetates, nitrates, permanganates, thiosulfates, and oxides, and combinations thereof.

44. The kit of claim 38, wherein the metal salt is selected from the group consisting of silver sulfate, silver perchlorate, silver nitrate, iron (II) chloride, zinc perchlorate, iron (II) perchlorate, iron (II) sulfate, copper acetate, sodium thiosulfate, magnesium thiosulfate, potassium thiosulfate, potassium nitrate, potassium permanganate, copper nitrate, copper II carbonate dihydroxide, copper sulfate, titanium (III) sulfate, magnesium nitrate, cerium (III) perchlorate, and cerium nitrate, and combinations thereof.

45. The kit of claim 38, wherein the metal salt is selected from the group consisting of molybdenum (VI) oxide, zinc sulfate, copper (II) chloride, nickel perchlorate, nickel sulfate, copper (II) perchlorate, tin (II) sulfate, tin (I) chloride, chromium (III) sulfate, aluminum sulfate, cerium (III) perchlorate, zinc perchlorate, titanium hydride, chromium (III) perchlorate, manganese (II) chloride, aluminum chloride, titanium (IV) chloride, silver chloride, and titanium (II) sulfate, and combinations thereof.

46. The kit of claim 38, wherein the oxidizing agent is sodium hydroxide.

47. The kit of claim 38, wherein the oxidizing agent is selected from the group consisting of hydrogen peroxide, sodium peroxide, zinc peroxide, calcium peroxide, barium peroxide, and lithium peroxide, sodium hydroxide and combinations thereof.

48. The kit of claim 38, wherein the metal salt preparation is a solution comprising between about 0.001% and about 20% (w/v) metal salt.

49. The kit of claim 38, wherein the oxidizing agent preparation is a solution comprising between about 0.1% and about 50% (w/v) peroxide.

50. The kit of claim 38, wherein the metal salt preparation is a solution comprising between about 0.025 % and about 8% (w/v) metal salt.

51. The kit of claim 38, wherein the oxidizing agent preparation is a solution comprising between about 0.3% and about 15% sodium hydroxide.

52. The kit of claim 38, wherein the preparations are concentrates suitable for dilution with solvents by a user.

*Method*  
53. Treating and coloring a wood substrate with the kit of claim 30, comprising the steps of:

(a) contacting the wood substrate with the first component solution preparation comprising the oxidizable metal salt, and allowing an effective amount of the first component solution preparation to penetrate the wood substrate, and sequentially,

(b) contacting the wood substrate with the second component solution preparation comprising an oxidizing agent, and allowing

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an effective amount of the second component solution preparation to penetrate the wood substrate,

(c) reacting in situ within the wood substrate the first and the second component solution preparations with each other in contact with the wood substrate, and

(d) imparting a stable color change to color characteristics of the wood substrate.

54. The treating of claim 53, further comprising the step of drying the wood substrate between the two contacting steps.

55. The treating of claim 53, wherein the solutions are applied between the freezing point and boiling point of the solutions under process conditions of the treating.

56. The treating of claim 53, further comprising providing a sealing coat over the wood substrate.

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